E.C.JORDAN CO.
CONSULTING ENGINEERS

4607-00
2.85.54

February 7, 1985

Mr. Robert Kowalczyk
Commanding Officer
Northern Division
Naval Facilities Engineering Command
Philadelphia Naval Base
Building 77L
Philadelphia, PA 19112

Dear Mr. Kowalczyk:

Subject: Proposed Characterization Study Step IB and
Addendum to Step IA - Verification Study
Pollution Abatement Confirmation Study
Naval Air Station, Brunswick, Maine

INTRODUCTION

In accordance with our letter of January 28, 1985 we are submitting for your review and comment, a suggested scope of work and related order of magnitude cost estimate for each of the sites identified in the Draft Report for which additional work was recommended for consideration.

Our draft report concluded that Step IB - Characterization be considered for Sites 1 and 3, and that limited additional study be done under the Step IA - Verification Step at Sites 4, 7, 8 and 9. It was concluded that further study at Site 2 was not warranted.

SITE 1 AND 3 STEP IB - CHARACTERIZATION

The result of this phase of study will be a quantitative assessment of the extent of contamination, sources, and contaminant migration potential. The study described briefly herein has been designed to evaluate the levels and distribution of contamination, both vertical and horizontal, around the contaminated sites. It will also evaluate contaminant migration, site hydrogeology and specifics of groundwater movement and/or surface water movement.

The scope of the proposed investigation at Sites 1 and 3 (Figure 1) will include a geophysical survey, test pit program, monitoring well program and surface water sampling.

562 CONGRESS STREET/P.O. BOX 7050 • PORTLAND, MAINE 04112 • (207) 775-5401/TELEX: 94-4329
OFFICES/SUBSIDIARIES IN READING, MA AND WASHINGTON, DC.

The scope of the proposed study will include the following key tasks:

Task	I	Geophysical Surveys
	II	Test Pit Program
	III	Monitoring Well and Groundwater Sampling Program
	IV	Surface Water Sampling
	V	Chemical Analyses
	VI	Evaluation and Report

The rationale for each task is described in more detail in the following sections.

TASK I - GEOPHYSICAL SURVEYS

A magnetometer survey is proposed at Site 3 to determine the presence and location of buried barrels and/or drums. The results of this survey will be used to locate test pits and borings/monitoring wells.

The magnetometer will also be used at Site 1 in an attempt to locate the former landfill trenches which may contain buried metal objects. Borings and monitoring wells will be located outside the suspected trenches to avoid drilling through refuse.

Seismic refraction profiling (4000 lineal feet) is proposed for determining the depth to bedrock or aquitard in the vicinity of Sites 1 and 3 (Figure 2). The purpose for determining bedrock surface will optimize the locations of the monitoring wells in the deep aquifer.

TASK II - TEST PITTING

Six test pits are proposed for Sites 1 and 3 (Figure 1). Three test pits are located at Site 1. The test pits will consist of small trenches 25 to 50 feet long. The purpose of these trenches will be to observed the subsurface soils and water table conditions, obtain soil samples for analysis and observe the conditions of the landfill trenches. Six soil samples will be analyzed for organochloride pesticides, PCB's and volatile organics, as shown on Table 2.

Three test pits are located surrounding Site 3 to describe the shallow surface soils, observe groundwater seepage conditions and obtain soil samples for chemical analysis. Six soil samples will be analyzed for organochloride pesticides, PCB's and volatile organics.

TASK III - MONITORING WELL AND GROUNDWATER SAMPLING PROGRAM

Thirteen borings and subsequent monitoring well installations are proposed for Sites 1 and 3 (Figure 1). The purpose of the borings and wells is to detect the presence of contamination in the soil and groundwater in the vicinity of

waste disposal sites. Twenty-three soil samples from borings will be analyzed for the presence of volatile organics. Six of these samples will be analyzed for organochloride pesticides and PCB's as shown on Table 2. The borings and wells are proposed to quantify the contamination in and around the perimeter of sites 1 and 3, in both the shallow and deep aquifers. The monitoring wells will be installed in the boreholes in the most pervious strata of the aquifers. At three locations downgradient from Site 1, multi-level (two) wells will be installed to monitor shallow (about 50 feet) and deep (about 100 feet) groundwater quality. In two locations deep (100 feet) monitoring wells will be installed adjacent to existing shallow wells. The multi-level wells will be used to obtain water levels and evaluate vertical gradients and thus permit an assessment of deep migration pathways. The total depth of soil drilling is estimated at 820 lineal feet and is summarized in Table 1.

Groundwater samples will be collected at the seven existing wells and the thirteen new wells.

The parameters recommended for laboatory chemical analysis include iron, lead, chromium, cadmium, volatile organics, organochloride pesticides and PCB's. Twenty groundwater samples will be analyzed for these parameters, as indicated in Table 2.

TASK IV - SURFACE WATER SAMPLING

The purpose of the surface-water sampling is to identify the impact of the site on the quality of the receiving water body (Mere Brook). The sampling plan suggested is an expansion of the plan followed in the Step-IA Verification Study. Sampling will be conducted during low flow conditions to eliminate the dilution effect of high runoff.

The surface water sampling locations are shown on Figure 1. The original surface water sampling locations (SW-001 through SW-004) will be resampled in conjunction with two additional sampling locations downstream to measure contribution of groundwater from site 1 to Mere Brook and Merriconeag Stream.

TASK V - CHEMICAL ANALYSIS

Each sample of soil or water will be chemically analyzed to identify and quantify the chemical contaminants present. A summary of the proposed analytical program is given in Table 2. The analyses specified for each sample type were chosen based on the type of wastes reported to have been disposed of at each site according to the IAS and the results of analyses conducted during the Step IA - Verification. The Chemical Monitoring Program is structured to provide identification of specific chemical compounds and to provide a quantitative assessment of contamination.

TASK VI - EVALUATION AND REPORT

To meet the objective of the Characterization Step, Jordan will review the data developed during Tasks I through V and will make a quantitative assessment of contamination. Actual versus potential migration from Sites 1 and 3 and the threat posed to human health and the environment will be evaluated to make recommendations for alternative remedial actions and monitoring programs.

Field data, a discussion of the approach used to evaluate areas requiring remedial actions, and evaluations developed in support of these recommendations will be presented in the Characterization Step Draft Report.

COSTS

Approximate order of magnitude costs for the proposed Step IB Characterization Study are included in Table 3. A summary of chemical analysis and costs are presented in Tables 2 and 4, respectively.

SITE 4 & 7 - ACID/CAUSTIC PIT AND OLD ACID/CAUSTIC PIT

Site 4 and 7 have been recommended for additional study under the Step IA Verification Study. The purpose for additional study is to; 1) accurately determine the direction of groundwater flow and; 2) monitor the groundwater quality for the presence of lead, volatile organics and PCB's downgradient from the disposal pit locations.

The proposed program consists of one additional boring/monitoring well, chemical analysis of 3 soil samples and 1 groundwater samples at each site (Figure 3 and 4).

SOIL SAMPLING

Soil samples should be taken from the proposed boring at three depths. These locations should be just above the water table, immediately below the water table and in the pervious sands above the marine silt and clay. Soil samples should be analyzed for the presence of lead, volatile organics and PCB's.

GROUNDWATER SAMPLING

The boring used for soil sampling should be completed as a monitoring well with a 10 foot screen set in the pervious sands immediately above the marine silt and clay. Based on water level observations obtained from this well and the three existing wells a groundwater contour map shall be constructed showing the direction of groundwater flow.

It is proposed to obtain a groundwater sample from the one new monitoring well at each site for chemical analyses. The groundwater samples will be analyzed for volatile organics, PCB's and lead. Resampling of the existing wells at each site may be requested by reviewing regulatory agencies. If resampling is requested and deemed appropriate, it can be conducted at a later date.

Costs for this phase of the Verification addendum are presented in Table 3. A summary of the proposed analytical program and costs are presented in Table 2 and 4, respectively.

SITE 8 PERIMETER ROAD DISPOSAL SITE

Site 8 has been recommended for further study under the Step IA Verification due to the presence of high levels of heavy metals that exceed the US EPA National Interim Primary Drinking Water Standards (lead and chromium) in shallow groundwater and the near proximity of the Jordan Avenue Wellfield. The purpose of additional study is to; 1) monitor the deep groundwater for the presence of contamination; 2) determine the significance of these contaminants in the shallow and deep groundwater aquifers and; 3) examine the impact of this

site on the surface water in the stream adjacent to the site. The proposed program consists of 3 deep borings/monitoring wells (about 50 feet), six soil soil samples, seven groundwater samples and seven surface water samples for chemical analysis.

SOIL SAMPLING

Two soil samples should be collected in each of the three borings for chemical analysis (Figure 4). These samples should be taken beneath the clay layer acting as an aquitard for the shallow groundwater in the pervious sands above the impermeable strata forming the aquitard for the deep groundwater. Chemical analyses of these samples should include volatile organics.

GROUNDWATER SAMPLING

The borings used for soil sampling will be completed as monitoring wells at about 50 feet of depth below ground surface. Ten foot wellscreens will be positioned in the pervious strata above the deep aquitard (bedrock/clay/till). Based on water level observations from these three wells surveyed to a local datum a groundwater contour map will be drawn showing the direction of deep groundwater flow.

Groundwater samples from existing and proposed monitoring wells will demonstrate the presence or absence of contamination in the deep groundwater and strengthen the data base on shallow groundwater contamination. This data will be necessary to evaluate the need for characterization on this site.

SURFACE WATER SAMPLING

The purpose of the surface water sampling program is to identify the impact of the site on the quality of the receiving stream, tributary to the Androscoggin River. The sampling plan suggested is an expansion of the initial round of surface water sampling and is shown on Figure 4. Samplng will be conducted during low flow conditions to eliminate the dilution effect of high stream flow.

It is suggested the original surface water sampling locations be resampled to strengthen the justification for eliminating this site from continued study or proceeding with the characterization Step-IB. Three additional sampling locations are recommended to determine the contribution of contaminants from the shallow groundwater to the surface water and dilution of contaminants with distance from the site.

Costs for the proposed program at Site 8 are included in Table 2. A summary of chemical analyses are presented in Table 3 with costs shown in Table 4.

SITE 9 - NEPTUNE ROAD DISPOSAL SITE

Site 9 has been recommended for additional study under the Step IA Verification Study due to the presence of volatile organics in surface water. The purpose of the proposed program is to determine by chemical analysis of surface water and sediment samples (Figure 3), whether volatile organic contaminants present in the surface water are coming from groundwater at Site 9 or surface runoff from the runway area. If the suspected source is the groundwater beneath Site 9 a monitoring well is proposed, located behind building number 201, to monitor groundwater quality. The addendum program will consist of 5 surface water and sediment samples for chemical analysis, one boring/monitoring well (optional based on surface water and sediment analyses), and two soil samples from the boring for chemical analysis.

SURFACE WATER SAMPLING

The surface water and sediment sampling locations are shown on Figure 3. Five samples are proposed to demonstrate the source of volatile organic contamination and the dilution of contaminants in surface water with distance from the site.

SOIL AND GROUNDWATER SAMPLING

If the results of chemical analyses of surface water and sediment samples indicate the contaminant source is groundwater beneath Site 9, one boring/monitoring well is proposed. Two soil samples taken from the boring will be analyzed for volatile organics. The boring will extend 30 feet from ground surface and a 10 foot wellscreen will be placed near the surface of the water table.

A groundwater sample will be taken from the proposed well at Site 9 and should be analyzed for iron, lead, chromium, cadmium, and volatile organics. Reviewing regulatory agencies may request additional sampling of groundwater and this can be accomplished, if appropriate, at a later date.

Costs for the proposed addendum at Site 9 are included in Table 2. A summary of laboratory analysis and costs are presented in Table 3 and 4, respectively.

2.85.54

We have been please to assist you in this portion of your project. We look forward to your review of our proposed scope of work and order of magnitude costs and welcome any questions, concerns or comments regarding its content.

Very truly yours,

E.C. JORDAN CO.

Raymond A. Allen, III
Soil Scientist

William R. Fisher, P.E.
Project Manager

TABLE 1
SUMMARY OF ESTIMATED QUANTITIES FOR
MONITORING WELL INSTALLATION
SITE 1 AND 3
STEP IB - CHARACTERIZATION
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

Monitoring Well No.	Estimated Depth (Ft.)	Well Materails 2" PVC Screen (Ft.)	Well Materails 2"-PVC Riser (Ft.)
MW-201	30	10	20
MW-202	30	10	20
MW-203	30	10	20
MW-204	30	10	20
MW-205	100	10	90
MW-206A	100	10	90
MW-206B[1]	50	10	40
MW-207A	100	10	90
MW-207B[1]	50	10	40
MW-208	100	10	90
MW-209	50	10	40
MW-210A	100	10	90
MW-210B[1]	50	10	40
	820	130	690

[1] Boreholes will be advanced to depth without sampling
[2] Soil samples will be obtained using a split spoon sampler at 5-ft. intervals.

TABLE 2
SUMMARY OF CHEMICAL ANALYSIS
STEP IB CHARACTERIZATION AND
ADDENDUM TO STEP IA VERIFICATION
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

SAMPLE SOURCE	MEDIA	IRON	LEAD	CHROMIUM	CADMIUM	VOA	PEST PCB
SITE 1,2 AND 3							
	BORING (SOIL)	--	--	--	--	23	6
	GROUNDWATER	20	20	20	20	20	4
	SURFACE WATER	6	6	6	6	6	--
	TEST PIT (SOIL)	--	--	--	--	12	12
SITE 4							
	BORING (SOIL)	--	3	--	--	2	2
	GROUNDWATER	--	1	--	--	1	1
SITE 7							
	BORING (SOIL)	--	3	--	--	2	2
	GROUNDWATER	--	1	--	--	1	1
SITE 8							
	BORING (SOIL)	--	--	--	--	6	--
	GROUNDWATER	7	7	7	7	7	--
	SURFACE WATER	7	7	7	7	7	--
SITE 9							
	BORING (SOIL)	--	--	--	--	2	--
	GROUNDWATER	1	1	1	1	1	--
	SURFACE WATER	5	5	5	5	5	--
	SEDIMENT	--	--	--	--	5	--
SUBTOTAL		47	54	47	47	100	34
DUPLICATES		5	6	5	5	10	4
BLANKS		--	--	--	--	10	--
TOTAL		52	60	52	52	122	38

TABLE 3
SUMMARY OF COSTS
SITES 1 AND 3
STEP IB - CHARACTERIZATION STUDY
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

SITE	TESTPITTING & DRILLING	LABORATORY	MANHOURS	LABOR	ODC's	TOTAL
1 & 3	$34,500.00	$16,750.00[1]	1,550	$49,800.00	$13,000.00	$114,050.00

SUMMARY OF COSTS
SITES 4, 7, 8 AND 9
STEP IA - VERFICATION STUDY ADDENDUM
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

SITE	TESTPITTING & DRILLING	LABORATORY	MANHOURS	LABOR	ODC's	TOTAL
4	$1,200.00	$1,066.00	100	$3,200.00	$600.00	$6,066.00
7	$1,200.00	$1,709.00	100	$3,200.00	$600.00	$6,709.00
8	$4,450.00	$4,530.00	250	$8,000.00	$1,650.00	$18,630.00
9	$1,200.00	$2,961.00	100	$3,200.00	$600.00	$7,961.00
TOTAL	$8,050.00	$10,266.00	550	$17,600.00	$3,450.00	$39,366.00

[1] Price includes duplicate and blank sample costs.

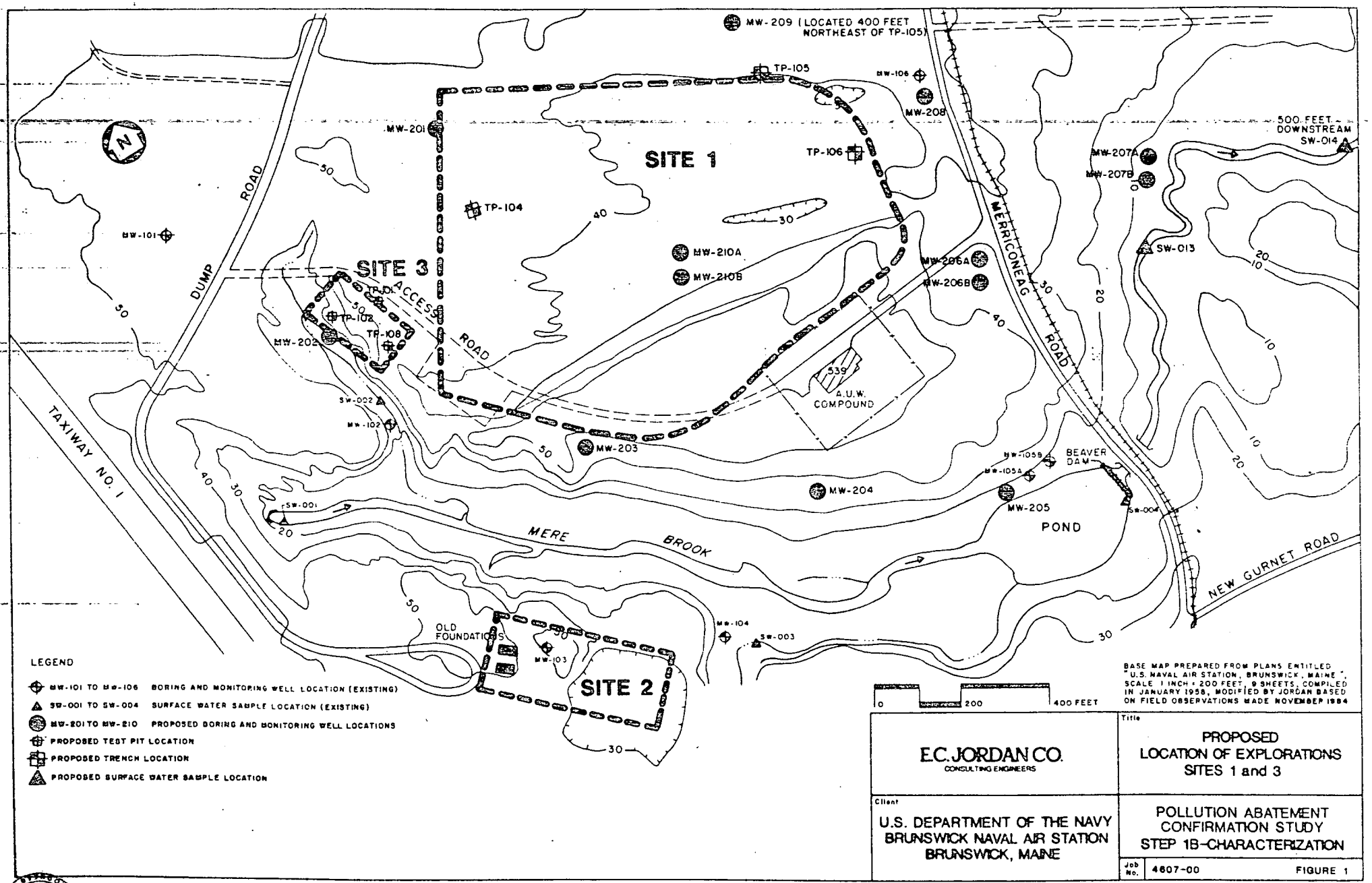
TABLE 4
SUMMARY OF ANALYTICAL COSTS
STEP IB - CHARACTERIZATION STUDY
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

SITE	ANALYSIS	MEDIUM	NUMBER OF SAMPLES[1]	Unit Cost	Total Cost
1 & 3	Iron	Water	29	$10.00	$290.00
	Metals[2]	Water	29	$63.00	$1,827.00
	VOA	Soil	39	$180.00	$7,020.00
		Water	29	$145.00	$4,205.00
	PCB/PEST.	Soil	20	$145.00	$2,900.00
		Water	5	$100.00	$500.00
					$16,742.00

SUMMARY OF ANALYTICAL COSTS
STEP IA - VERIFICATION STUDY ADDENDUM
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

Site	Analysis	Medium	Number of Samples[1]	Unit Cost	Total Cost
4	Lead	Soil	3	$49.00	$147.00
	(Alone)	Water	1	$24.00	$24.00
	VOA	Soil	2	$180.00	$360.00
		Water	1	$145.00	$145.00
	Pest./PCB	Soil	2	$145.00	$290.00
		Water	1	$100.00	$100.00
					$1,066.00
7	Lead(Alone)	Soil	4	$49.00	$196.00
		Water	2	$24.00	$48.00
	VOA	Soil	3	$180.00	$540.00
		Water	2	$145.00	$290.00
	Pest./PCB	Soil	3	$145.00	$435.00
		Water	2	$100.00	$200.00
					$1,709.00
8	Iron	Soil	15	$10.00	$150.00
	Metals[2]	Water	15	$63.00	$945.00
	VOA	Soil	7	$180.00	$1,260.00
		Water	15	$145.00	$2,175.00
					$4,530.00
9	Iron	Water	7	$10.00	$70.00
	Metals[2]	Water	7	$63.00	$441.00
	VOA	Soil	8	$180.00	$1,440.00
		Water	7	$145.00	$1,010.00
					$2,961.00

1 Includes duplicate samples
2 Lead chromium cadmium



E.C. JORDAN CO.
CONSULTING ENGINEERS

Title
PROPOSED
LOCATION OF EXPLORATIONS
SITES 1 and 3

Client
U.S. DEPARTMENT OF THE NAVY
BRUNSWICK NAVAL AIR STATION
BRUNSWICK, MAINE

POLLUTION ABATEMENT
CONFIRMATION STUDY
STEP 1B-CHARACTERIZATION

Job No. 4607-00 FIGURE 1

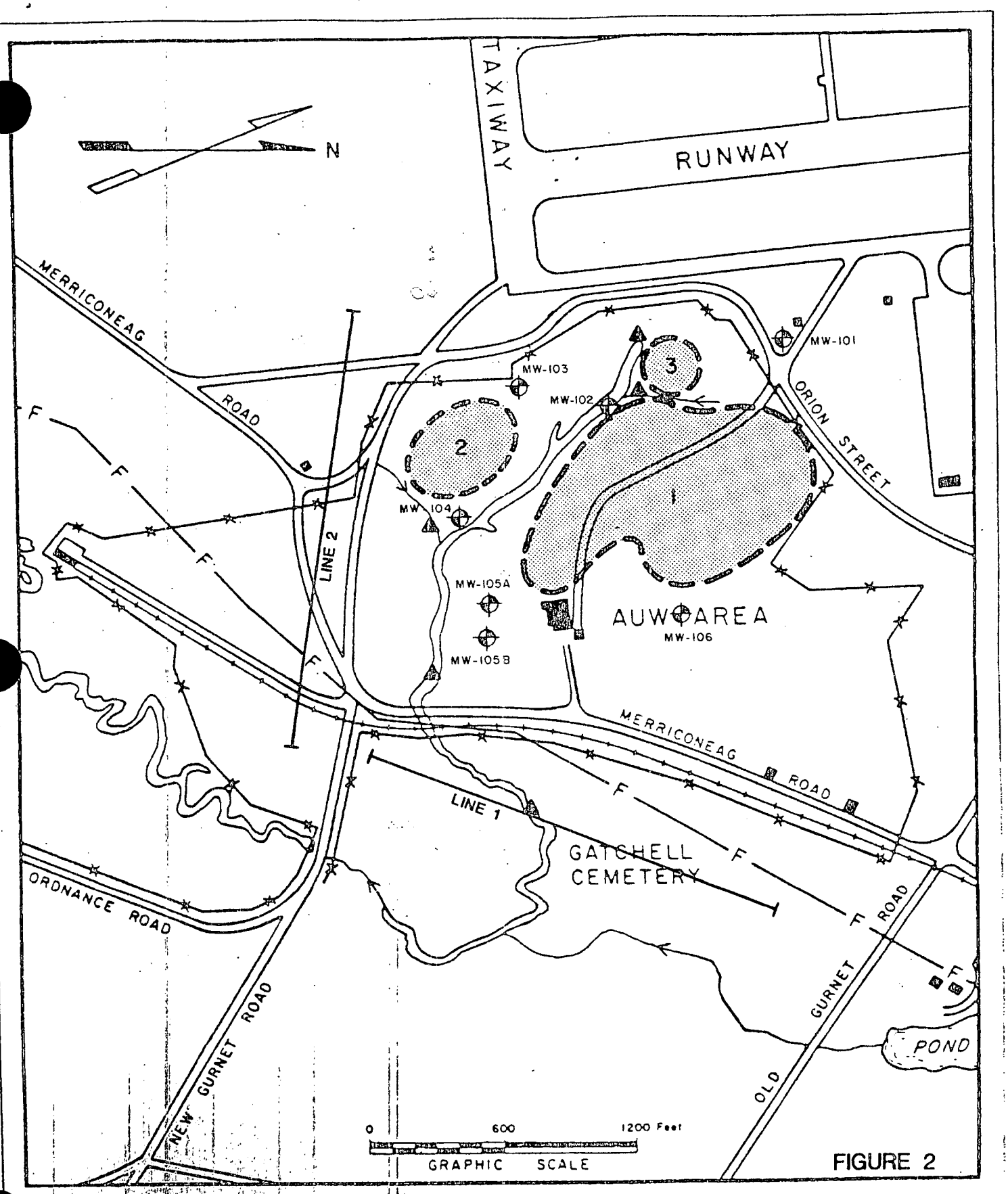


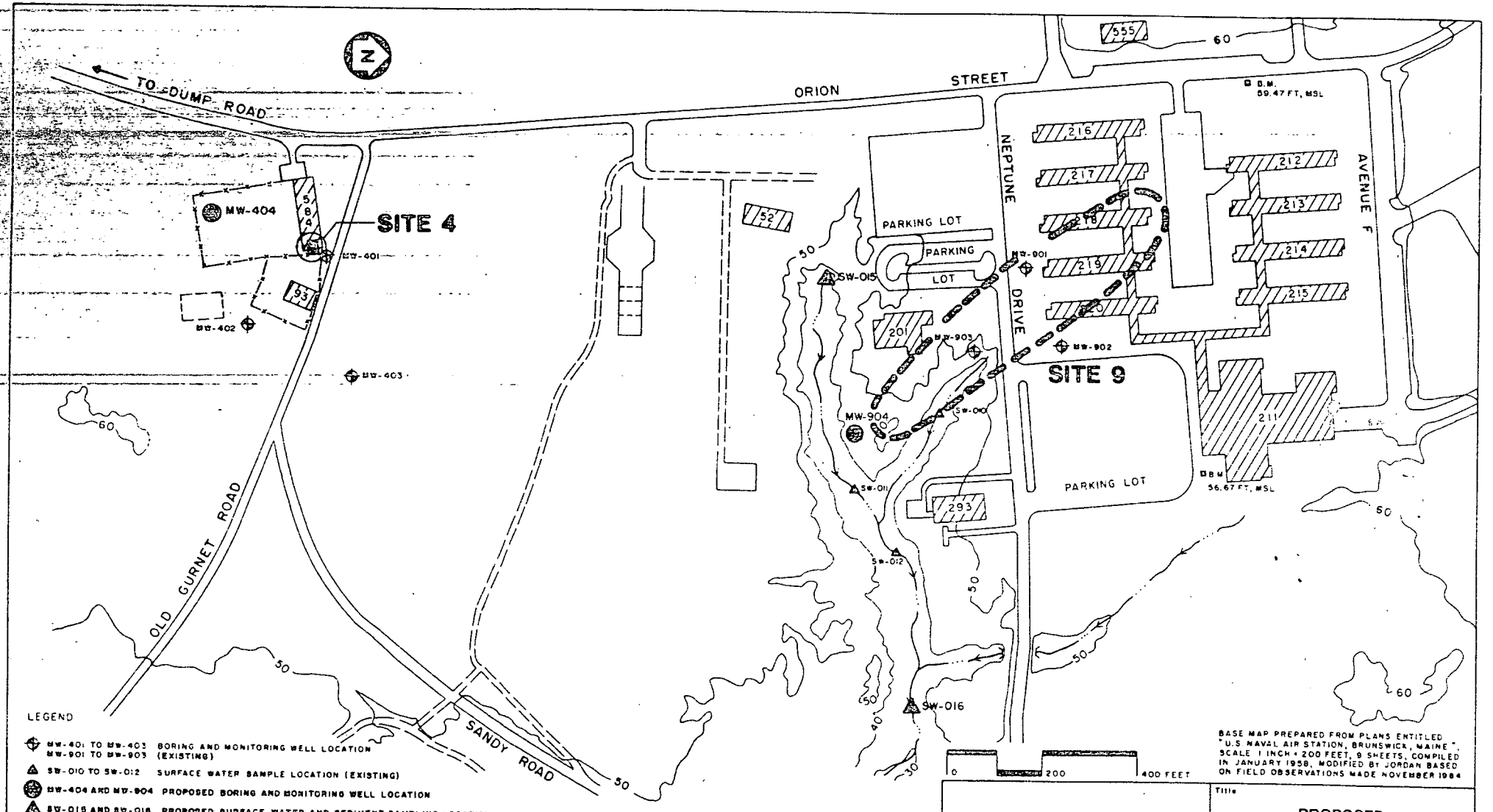
FIGURE 2

LEGEND

- BORING AND MONITORING WELL INSTALLATION AND GROUNDWATER SAMPLING LOCATION (EXISTING)
- SURFACE WATER SAMPLE LOCATION (EXISTING)
- APPROXIMATE LOCATION OF WASTE SITE
- SEISMIC PROFILE LINES

PROPOSED LOCATION OF SEISMIC PROFILES
SITES 1 and 3
STEP 1B-CHARACTERIZATION
POLLUTION ABATEMENT CONFIRMATION STUDY
BRUNSWICK NAVAL AIR STATION

E.C. JORDAN CO.



LEGEND

- MW-401 TO MW-403, MW-901 TO MW-903 (EXISTING): BORING AND MONITORING WELL LOCATION
- SW-010 TO SW-012: SURFACE WATER SAMPLE LOCATION (EXISTING)
- MW-404 AND MW-904: PROPOSED BORING AND MONITORING WELL LOCATION
- SW-015 AND SW-016: PROPOSED SURFACE WATER AND SEDIMENT SAMPLING LOCATION

BASE MAP PREPARED FROM PLANS ENTITLED "U.S. NAVAL AIR STATION, BRUNSWICK, MAINE", SCALE 1 INCH = 200 FEET, 9 SHEETS, COMPILED IN JANUARY 1958, MODIFIED BY JORDAN BASED ON FIELD OBSERVATIONS MADE NOVEMBER 1984

E.C. JORDAN CO.
CONSULTING ENGINEERS

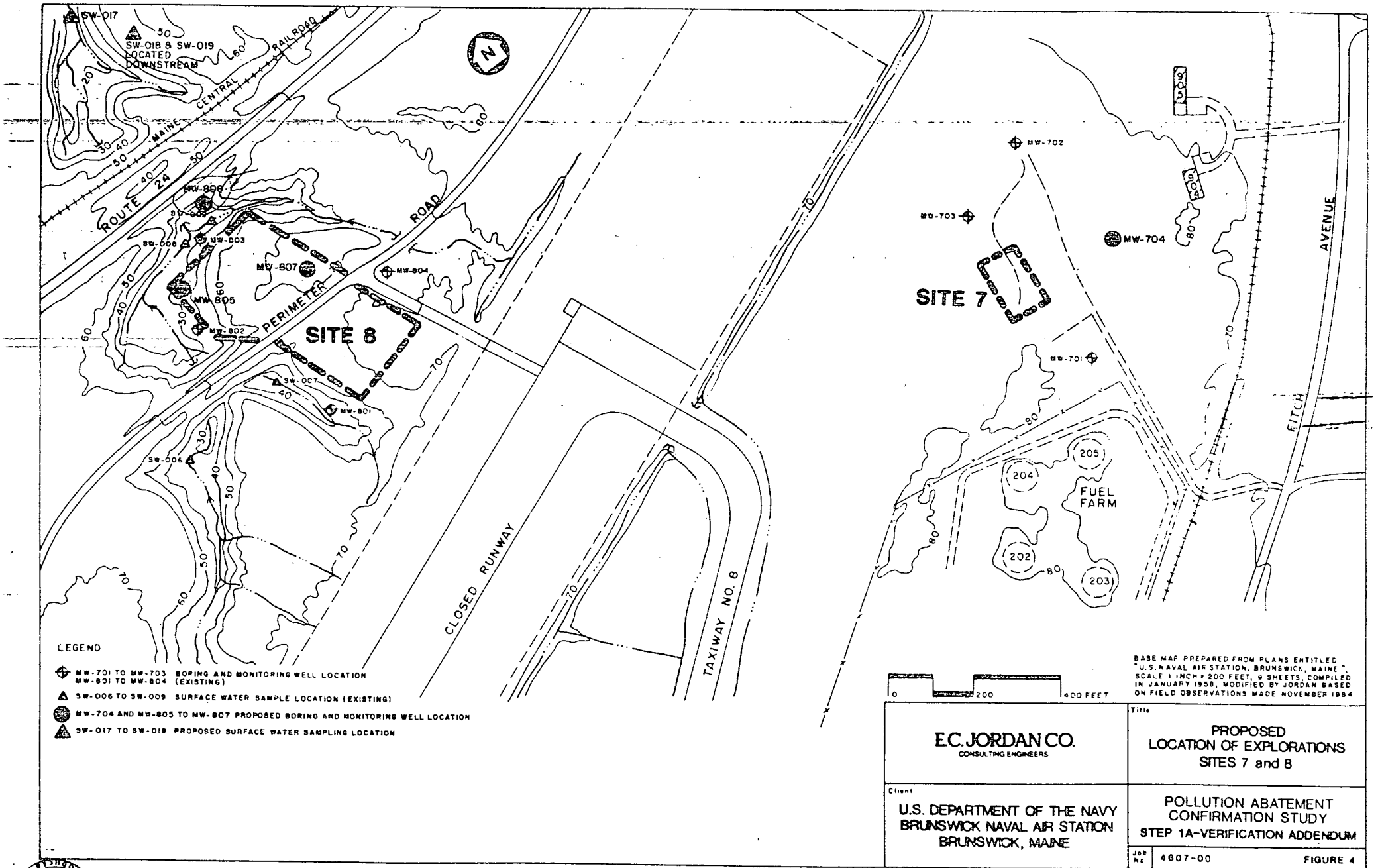
Client
U.S. DEPARTMENT OF THE NAVY
BRUNSWICK NAVAL AIR STATION
BRUNSWICK, MAINE

Title
PROPOSED
LOCATION OF EXPLORATIONS
SITES 4 and 9

POLLUTION ABATEMENT
CONFIRMATION STUDY
STEP 1A-VERIFICATION ADDENDUM

Job No. 4607-00

FIGURE 3



E.C. JORDAN CO.
CONSULTING ENGINEERS

Title
PROPOSED
LOCATION OF EXPLORATIONS
SITES 7 and 8

Client
U.S. DEPARTMENT OF THE NAVY
BRUNSWICK NAVAL AIR STATION
BRUNSWICK, MAINE

POLLUTION ABATEMENT
CONFIRMATION STUDY
STEP 1A-VERIFICATION ADDENDUM

Job No. 4607-00 FIGURE 4